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ABSTRACT

A model of student persistence that considers the role of student finances and student financial aid was investigated in 1980, with a focus on federal campus-based aid. Linear Structural Relations (LISREL), a more versatile technique than traditional path analysis, accounted for 42 percent of the variance in the persistence of 343 new freshmen financial aid recipients at a major urban university in the Southwest. The results indicate that financial need, student residency status, and noncampus-based loans and grants have direct effects on new freshman persistence regardless of the type or amount of campus-based aid awarded. The direct effect of each federal campus-based program on persistence was significant and positive. The effect of Supplemental Educational Opportunity Grants on student persistence was about half that of National Direct Student Loans and the College Work Study program. The model accounted for about 23 percent of the variance in academic performance; high school rank had the largest direct effect on cumulative grade point average. Implications for administrators and researchers are discussed. (Author/SW)

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FINANCIAL AID AND NEW FRESHMAN PERSISTENCE:

AN EXPLORATORY MODEL

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This paper was presented at the Twenty-Fourth Annual Forum of the Association for Institutional Research held at the Hyatt-Regency in Fort Worth, Texas, May 6-9, 1984. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum papers.

Daniel R. Coleman, Chairman
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Abstract

LISREL, a more versatile technique than traditional path analysis, was employed to account for 42% of the variance in the persistence of 343 new freshmen financial aid recipients at a major urban university. Unlike recent persistence models, the specific model developed here highlights the impact of student finances, in particular the programs of federal campus-based aid, on persistence. The results indicate that financial need, student residency status, and noncampus-based loans and grants have direct effects on new freshman persistence regardless of the type or amount of campus-based aid awarded. The direct effect of each federal campus-based program on persistence was significant and positive. Implications for administrators and persistence researchers are discussed.

Introduction

Advances in conceptual orientations and methodologies have characterized recent research in the area of student persistence. Since 1970, a number of conceptual models (Bean, 1979, 1983; Rootman, 1972; Spady, 1970; Tinto, 1975) have been proposed to explain the persistence behavior of college students. The superiority of model-based analyses to the atheoretical studies that prevailed during most of the history of persistence research is without question. Still, none of the existing models includes consideration of student finances and student financial aid on persistence behavior. This is a major shortcoming of such research (Tinto, 1982).

Other circumstances underscore the need for research in this area. Over half of all students enrolled in the nation's colleges and universities receive some kind of financial assistance (Atwell, 1981). At a time when the cost of attending college continues to escalate, two of three freshmen who enroll in public institutions have a documented need for financial assistance (Stampen, 1983). The financial need of the majority of students entering public colleges cannot be ignored since the freshmen year is also the most critical time in a collegiate career for decisions to persist (Ramist, 1982).

Given the symbiotic union of needy students, institutions, and financial aid, college administrators might wish to know how they can distribute financial aid in order to impact freshman persistence. This issue is quite complex; few programs of financial aid are sufficiently malleable at the institutional level to achieve increased persistence rates because the majority of financial aid dollars in the United States flow first to students and, in turn, to institutions. The programs of federal campus-based aid, however, are an important exception to the unwieldiness of most financial aid programs because institutions can excercise discretion in determining what students will be aided from which programs and in what amount. These programs, the National Direct Student Loan (NDSL), the Supplementary

Educational Opportunity Grant (SEOG) program, and the College Work Study (CWS) program may represent an important institutional tool that can be employed to promote persistence.

Literature Review

Most research tracing the impact of student finances on persistence is quite dated; the amount and type of financial aid considered in previous studies are substantively different than amounts and types currently available. Astin (1975), for example, continues to influence much of the conventional wisdom about the link between financial aid and persistence although these findings may have questionable relevance today because of the absence of, or incomplete funding of, federal and state programs that constitute the present system of financial aid. The Pell Grant program (formerly the BEOG program) did not exist during the course of Astin's study and appropriations for College Work Study and the National Direct Student Loan program were substantially less than at present. Jensen (1981) reports that the amount of federal financial aid available to students has increased sixty-six times since 1968, suggesting that earlier conclusions about the effect of financial aid on persistence may be outdated.

In addition, few studies have linked student persistence and the manner in which different types of financial aid are combined. Typical studies of the impact of grants, loans, and work on persistence almost always examine each type of aid separately without paying attention to whether or not students also received additional types of assistance (Hood & Maplethorpe, 1980). Jensen (1981), for instance, reports that receiving financial aid makes a small contribution to persistence. Because Jensen's research is limited to the aggregate effects of a student's total aid award, the usefulness of this finding is restricted. Subsequent sections review the individual impact of grants, loans, and work on student persistence.

Grants

Grants are considered the most desirable form of assistance from a student's perspective. Grants are nonrepayable and therefore constitute a "gift" to the student. In general, Astin (1975) reports that grants have a positive effect on persistence while loans have a negative effect. More recent research (Bergen & Zielke, 1979; McCreight & LeMay, 1982) indicates that grant recipients do not persist or perform at a significantly different rate than nonrecipients.

Loans

Astin (1975) reports that receipt of a loan during the freshman year has a moderately negative effect on persistence for men. Other research (Blanchfield, 1971) suggests that the impact of loans on persistence is not significant while still other findings indicate no significant differences between grants and loans (Peng & Fetters, 1978).

Work

In examining on-campus employment during the freshman year, Astin (1975) reports a small but significant increase in persistence, particularly among Blacks who were more likely to receive assistance through work. Other researchers have found College Work Study to be positively associated with freshman persistence (Blanchfield, 1971; Herndon, 1981).

Method

The Sample

The sample consisted of 343 campus-based awardees who were new freshmen at a major university located in the Southwest in the fall of 1980.[1] Males constituted 53.1% of the sample and Females 46.9%. Minority group members (26.5%) constituted

[1]The initial sample consisted of 424 new freshmen. A new freshman was defined as a student who had not completed any academic credit in a postsecondary institution prior to the fall semester; transfer students and students who had attended the university any time prior to that fall were not included in the initial sample. Moreover, students for whom high school rank and standardized achievement scores, American College Testing (ACT) or Scholastic Aptitude Test (SAT) scores, were unavailable were also excluded from the study.

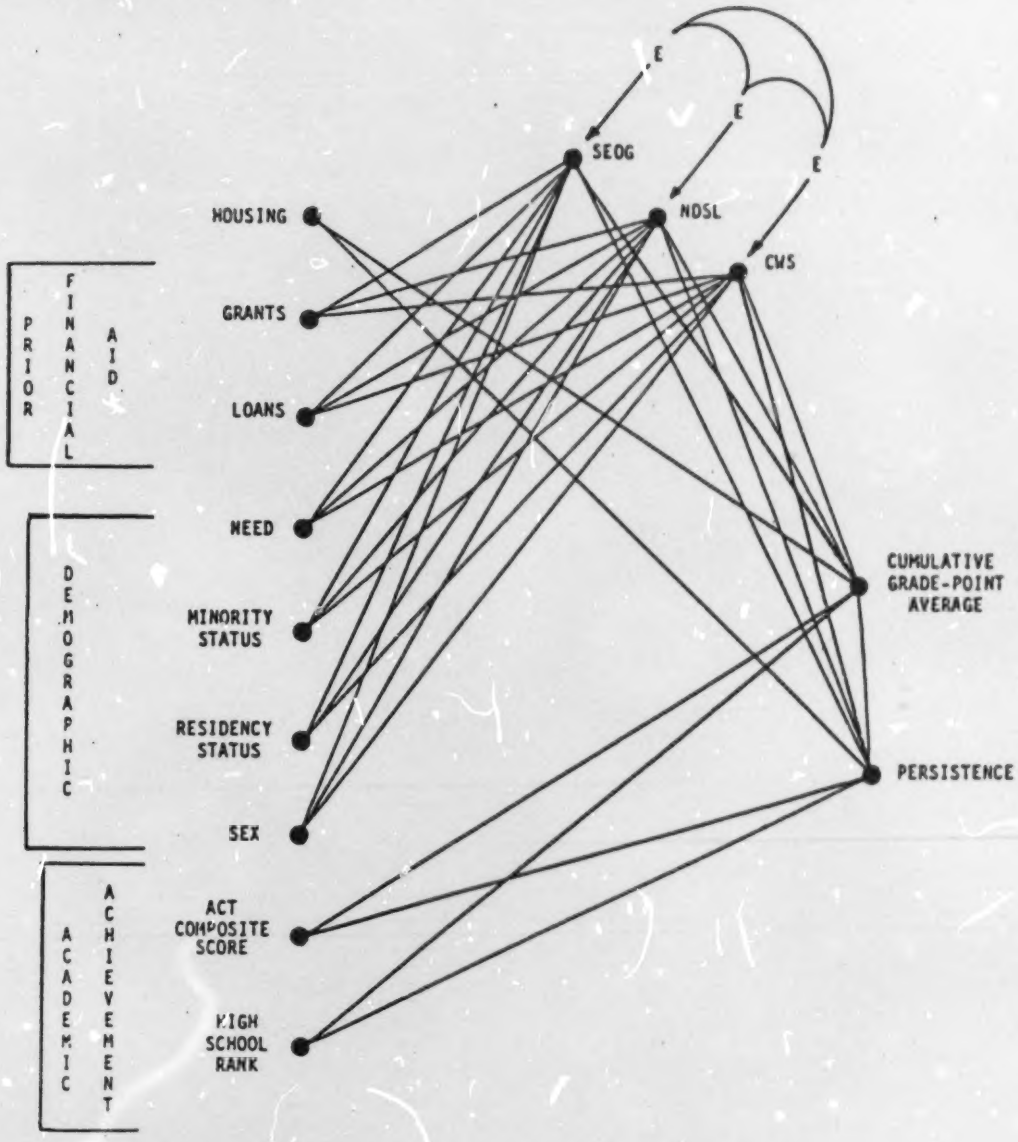
higher proportions of the sample than was suggested by their representation in the entering freshman class. In the fall of 1980, 10.8% of the new freshman who enrolled in the university were members of a minority group. Higher minority group representation in the sample is probably attributable to higher need for financial assistance which, in turn, may be caused by relatively lower financial resources among minority students or their families.

Statistical Techniques

Structural equation modeling was employed to allow specification of a priori relationships among variables selected for study and to provide simultaneous analyses of the effects of variables posited to effect other variables. Other persistence models (e.g., Bean, 1979, 1983; Pascarella & Terenzini, 1977, 1979; Terenzini & Pascarella, 1980; Terenzini, Lorang, & Pascarella, 1981) use a limited application of structural modeling--path analysis. A more versatile form, Linear Structural Relations (LISREL), now in its fifth edition, LISREL V, (Jöreskog & Sörbom, 1981) was employed to analyze the model presented as Figure 1.

LISREL provides at least three advantages not available to researchers who utilize Ordinary Least Squares regression to analyze structural models. First, LISREL provides a chi-square statistic that researchers can employ to test how well a given model fits the observed data. Second, the LISREL V program provides a matrix of modification indices that suggest where paths may be added to a model in order to improve the fit of the model to the observed data. Third, LISREL allows researchers to specify models with correlated error terms among endogenous variables thereby allowing specification of more "authentic" models since one may argue that most variables with the potential to effect observed rates of persistence must share some common variance. Other advantages to persistence researchers are inherent in the LISREL V program and are discussed in subsequent sections.

In the present investigation, the chi-square statistic was employed to make a series of successive improvements to the initial model which were suggested by



Note. Exogenous variables are correlated.

Figure 1

The Initial Persistence Model

the modification indices. Each time a new parameter was added to the initial model, the chi-square test was employed to evaluate whether the inclusion of the new path resulted in a significant improvement in the fit of the model to the data. Thus, the procedure of model development utilized in this study was a process of nesting each of series of less constrained models within a previous model. When a series of these improvements result in a significant level of chi-square for the appropriate degrees of freedom, the null hypotheses may be accepted, allowing the model to be used as a basis to explain the strength of association among variables under study and to operationalize other null hypotheses concerning the relationships specified by the model.

Persistence

Persistence was defined as the number of regular semesters of full-time attendance, excluding summer sessions, that students were at the university. A period of three semesters was selected as the timeframe for measuring persistence in this study. Other studies frequently consider persistence as a dichotomous criterion variable, e.g., scoring nonpersisters as 0 and persisters as 1. This metric was expanded in the present study to measure persistence both within and between semesters.[2] No attempt was made to distinguish among nonpersisters who might have been classified as stopouts or dropouts although the time span used in this investigation is one in which decisions to leave an institution are likely to be permanent.

Exogenous and Endogenous Variables

Exogenous variables in this investigation include: Need, Grants, Loans, Sex, Minority Status, Residency Status, High School Rank, ACT Composite Score, and

[2]Persistence was operationalized by an indicator variable where code "0" identifies students who enrolled for the first semester but withdrew during that semester. "1" denotes students who completed the first semester but did not re-enroll the second semester, but withdrew during that semester. "3" identifies students who completed the second semester but did not re-enroll the third semester. "4" denotes students who enrolled for the third semester, but withdrew that semester. "5" identifies students who completed the third semester.

Housing Status. Need is a standardized dollar measure of each student's relative cost of college attendance. Financial aid personnel compute Need by considering student or family resources, i.e., ability to pay for college costs before financial aid is awarded. Grants and Loans represent the dollar amount of financial aid awarded to subjects from sources other than the federal campus-based programs. Thus, the variable Grants includes the amount of entitlement aid from such sources as Pell Grants, the State Student Incentive Grant program, and, for Indian students, Bureau of Indian Affairs Higher Education Assistance Grants. The variable Loans includes the total amount of loan support other than that from the campus-based NDSL program, i.e., Guaranteed Student Loans, Nursing Loans, and Law Enforcement Administration Loans. High School Rank is a percentile that indicates student standing relative to his or her high school graduating class. ACT Composite Score is a standardized achievement score that provides an index of academic ability. Sex, Minority Status, Residency Status, and Housing Status were dummy coded in the analyses.[3]

Endogenous variables include: dollar amounts awarded students from the three federal campus-based aid programs (SEOG, NDSL, and CWS), cumulative grade point average, and persistence. In Figure 1, error terms for the campus-based aid variables were correlated since causes outside the model, i.e., the discretion applied by financial aid personnel in determining which students would receive assistance from which program, are almost certainly correlated.

Rationale for the Structure of the Model

The structure of the initial model is predicated on existent conceptual orientations to the study of persistence and consideration of the professional practice of awarding financial aid. The following assumption, consistent with

[3]Dummy coded values were: Sex, 0 = Male, 1 = Female; Minority Status, 0 = White or Other, 1 = Asian, Black, Hispanic, or Indian; Residency Status (first semester), 0 = In-state, 1 = Nonresident; Housing Status (first semester), 0 = Off-Campus, 1 = University Housing.

the Tinto model (1975), underlies the specification of the initial model: student prematriculation characteristics have no direct effect on cumulative grade point average or persistence. The model specifies that the direct effect of demographic variables and prior financial aid variables (Grants and Loans) on cumulative grade point average and persistence is mediated by the three programs of federal campus-based aid. In order to highlight the role of federal campus-based aid in the persistence process, the present study considers SEOG, NDSL, and CWS as critical collegiate influences that have potential to explain variation in academic performance and persistence. Because the model is specified in this manner, the federal campus-based aid programs may be viewed as constructs of academic and social integration, two concepts shown to determine variation in freshman persistence in previous research (see, for example, Pascarella & Terenzini, 1979).

Important exceptions to this assumption are the posited effects of Housing and the academic achievement variables (High School Rank and Act Composite Score). None of these measures are depicted as determining variance in SEOG, NDSL, or CWS since neither academic promise nor living in university residence halls are utilized as criteria for deciding the type of amount of campus-based assistance a student receives. Because of the potential of living in university residence halls for student integration in campus life (Chickering, 1974) a prediction is made that a significant relationship exists between housing and cumulative grade point average and between housing and persistence. Similarly, student academic achievement has been reported to have significant direct effects on persistence (Kohen, Nestle, & Karmas, 1978; Pantages & Creedon, 1978). Both academic achievement variables selected for this study measure past academic performance, the effects of which are probably mediated by other factors in a college environment, but which are not considered here.

Results

Table 1 displays the results of successive improvements to the initial model. The initial model, referenced as Model 1 had an associated chi-square value of 86.75 with 30 degrees of freedom. The result of each of the five improvements, consistent with the restrictions concerning the awarding of campus-based aid previously mentioned, was a final model with a chi-square value of 30.94 with 25 degrees of freedom. Three of the five improvements were significant at the .001 probabilty level. Other improvements are significant at the .01 level. Three further attempts at improving the model, consistent with the restrictions governing the awarding of federal campus-based aid, were not significant at the .05 level and are not displayed.

The final model, referenced as Model 6, has an associated probability of .191, indicating a moderately good fit of the model to the data. Although the final model represents a substantial improvement over the initial model, no claim can be offered that the final model is the only way in which the relationships among the variables chosen for this study can be specified since competing models may fit the same data equally well (Pedhazur, 1982). Nonetheless, the result of five statistically significant improvements to the initial model indicate that Residency Status, Loans, Grants, and Need have direct, or unmediated, effects on new freshman persistence and that financial need also has a direct effect on new freshman cumulative grade point average. Thus the assumption that these student prematriculation characteristics have no direct effects on cumulative grade point average or persistence in the model under investigation is not held.

Parameter Estimates

Since a single indicator model was posited in this investigation, the maximum likelihood parameter estimates for the final model (Table 2) are synonymous with the term "path coefficients" in traditional path analysis. The R^2 for all variables in explaining persistence is .417, meaning that the final model accounts for

Table 1

Chi-Square for Model with Indirect Effects of
Prior Financial Aid and Demographic Variables on Cumulative Grade-Point Average
and Persistence, and Chi-Square Change for Improvements to the Model

Constraints		x^2	d.f.	p	Models Compared	x^2 Difference	p
Model 1.	The effect of prior financial aid variables and demographic variables on Cumulative Grade-point Average and Persistence is mediated by Campus-based aid.	86.57	30	.000			
Model 2.	Residency Status to Persistence free	72.73	29	.000	2 and 1	13.84	.001
Model 3.	Need to Cumulative Grade-point Average free	57.47	28	.000	3 and 2	15.26	.001
Model 4.	Loans to Persistence free	50.76	27	.004	4 and 3	6.71	.01
Model 5.	Grants to Persistence free	44.00	26	.015	5 and 4	6.76	.01
Model 6.	Need to Persistence free	30.94	25	.191	6 and 5	13.06	.001

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Table 2

Maximum Likelihood Parameters for the Final Model

From	To	Persistence	Cumulative Grade-Point Average	SEOG	NDSL	CWS
Housing		.075	.142**	—	—	—
Grants		.242***	---	.484***	-.137*	-.204**
Loans		.132**	—	-.053	.041	.023
Need		-.239***	-.246***	.260***	.327***	.378***
Minority Status		---	---	-.014	-.177***	-.025
Residency Status		-.153**	---	-.110*	.171**	.009
Sex		---	---	.003	-.087	.029
ACT Composite Score		-.077	.116*	---	---	---
High School Rank		.027	.304***	---	---	---
SEOG		.113*	.036			
NDSL		.259***	.180***			
CWS		.224***	.186***			
Cumulative Grade-Point Average		.487***				
	R^2	.417	.232	.435	.233	.111

*$p < .05$
**$p < .01$
***$p < .001$

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about forty-two percent of the variance in new freshman persistence. Cumulative grade point has the largest direct effect on persistence, nearly twice that of the second most significant variable, NDSL. Each of the campus-based aid programs has a statistically significant effect on persistence although the effect of SEOG is about half that of NDSL and CWS. Two variables Need and Residency Status have a significant negative direct effect on persistence. Other direct paths to persistence are not statistically significant.

The R^2 for all variables depicted as determinants of Cumulative Grade Point average is .232, meaning that the model accounts for about 23 percent of the variance in academic performance. High School Rank has the largest direct effect on Cumulative Grade Point Average. Among the campus-based aid variables, only SEOG (.036) fails to reach statistical significance in determining levels of academic performance. Need has the second largest direct effect (-.246) in determining Cumulative Grade Point Average.

Six variables have direct effects on the campus-based aid variables in the final model. Loans and Sex are not significant determinants of the type or amount of SEOG, NDSL, or CWS. Significant direct effects of levels of SEOG are found in Grants, Need, and Residency Status. Variables significantly related to NDSL are Need, Minority Status, and Residency Status. Only Need and Grants appear to cause significant variation in CWS. Although the variable Loans has no significant direct effect in determining levels of campus-based aid, it has a significantly positive direct effect on persistence. No support is found in this study for the proposition that loans, either NDSL or noncampus-based loans, have a negative effect on new freshman persistence. The results here indicate the opposite to be true.

Direct, Indirect, and Total Effects

Indirect effects are the product of parmeter estimates between any variable and a mediating variable, and that mediating variable and the dependent variable.

Total effects are the sum of both direct and indirect effects of a variable on a dependent variable. Accordingly, the five variables with significant total effects in explaining Cumulative Grade Point Average are: High School Rank (.304), CWS (.186), NDSL (.180), Housing (.142), and ACT Composite Score (.116). The direct negative effect of Need on Cumulative Grade Point Average (-.245) is positively mediated by the effect of the federal campus-based aid programs (.139). Thus, the programs of campus-based aid appear to mediate the negative effect of financial need on academic performance.

Cumulative Grade Point Average (.487) had the largest total effect on persistence in the final model. Other total effects on persistence, in absolute rank order, were: CWS (.315), NDSL (.286), Grants (.194), High School Rank (.175), Loans (.147), Housing (.145), SEOG (.131), Residency Status (-.105), Need (-.093), Minority Status (-.071), ACT Composite Score (-.021), and Sex (.021). It is interesting to note that both academic achievement variables are significant predictors of Cumulative Grade Point Average, but, by themselves, do not appear to be potential determinants of new freshman persistence.

Discussion

The majority of the financial aid dollars in the United States flow as direct assistance from the federal government to students and are, consequently, beyond institutional control. Federal campus-based programs, however, are an important exception because funds flow first to institutions who then decide which students to award from which of these programs and in what amount. At most public institutions, these programs are the only category of financial aid that can be manipulated to promote student persistence. Private institutions can excercise discretion in awarding both the federal campus-based programs and privately or internally financed aid programs. Although this study focuses on federal campus-based aid, its findings might be extended to other forms of institutionally controlled aid which colleges are free to distribute in the same fashion as federal campus-based aid.

Implications for Institutions

Several implications for administrators are found in this paper. First, the programs of federal campus-based aid have a significant positive effect on new freshman persistence. All programs were found to have statistically significant direct effects in the model, although SEOG appeared to have a lesser effect than CWS or NDSL. In a sense, CWS and NDSL convey an advantage not associated with the nonrepayable SEOG program. Under the CWS program, institutions receive "payment in kind" as students work in positions that presumably benefit the college. Under the NDSL program, students, after graduation or termination of their education, are obligated to repay borrowed amounts directly to an institution, thus replenishing the pool of money from which the award was made. Still, no one program of campus-based aid appears clearly superior to others in promoting persistence and it is not possible, therefore, to state that one should be substituted in place of another for achieving persistence.

Second, noncampus-based grants and loans also have positive effects on new freshman persistence. Although these programs are beyond institutional discretion and, therefore, cannot be combined in student aid packages with the same flexibility as SEOG, NDSL, or CWS, they also appear vital to enhancing the persistence of new freshmen with high financial need. Institutions should articulate the benefits of noncampus-based grants and loans to policymakers. This has particular importance at a time when the federal government continues to contemplate fundamental changes in resources it makes available for student financial aid.

Third, controlling for the effects of other variables in the final model, new freshmen living in university residence halls have better cumulative grade point averages. This suggests that social interaction with peers and proximity to campus life may foster better grades. Since academic performance is clearly linked with persistence, a program that facilitates peer interaction and familiarity with the campus for commuter students may have the potential for increasing persistence rates.

Implications for Researchers

This study demonstrates the importance of student finances in explaining the persistence of new freshmen financial aid recipients at a large urban university. The model developed here suggests that noncampus-based grants and loans, financial need, and student residency status have direct effects on persistence. In subsequent efforts to evolve student persistence models these prematriculation characteristics should be posited as key components with the potential to explain substantial variation in persistence.

While the present model shows that student finances have a significant effect on new freshman persistence, it does not explain why. Future work in this area should investigate why, for example, loan amounts appear to have a positive effect on new freshmen persistence. Moreover, financial need clearly has a negative effect on persistence; the model was unable to reveal if this was an artifact of, for example, low parental education, poor secondary school preparation, or diminished self-esteem. These factors may be confounded with financial need and future study may unravel meanings among other variables that are associated with financial need.

Although the model did not demonstrate that minority students persist at a lesser rate than might be expected given the overall underrepresentation of minorities in higher education (Astin, 1982), the model should be tested on individual minority groups. Larger samples of minority students could be drawn from individual colleges to allow separate replications for Asians, Blacks, Hispanics, and Indians. Such studies would be useful in determining what types or combinations of financial aid appear most strongly linked with persistence for each of these groups. Since minorities are likely to constitute a large portion of any institution's financial aid recipients, such research seems warranted.

LISREL can be also profitably applied to other persistence models. The Tinto model, for example, specifies that low levels of student social integration within an institution may be compensated for by high levels of academic integration. This

is precisely the type of structural equation problem to which LISREL, not traditional path analysis, can be applied since LISREL allows the specification of nonrecursive models with reciprocal causation, i.e., the positing of relationships between variables thought to mutually influence each other. LISREL also frees researchers from many of the more untenable assumptions that are associated with traditional path analysis. It is unreasonable to assume, as is necessary in path analysis, that residual terms from different equations are uncorrelated. Moreover, many variables of interest in the social sciences are unobservable, e.g., self-esteem, motivation, attitudes toward education. To capture unobservable, or latent, variables LISREL provides researchers the ability to specify models with multiple indicators of latent variables and also provides methods for assessing the reliability of these unobserved constructs. The benefits of LISREL as a sophisticated analytical tool that can be employed in the evolution of persistence research should not be overlooked.

Previous models of student persistence have not considered the role of student finances and student financial aid. Although the results of this study are limited to a single sample of new freshmen at a single institution, the analyses presented here indicate the importance of student finances in the persistence process in general and the effects of the federal campus-based aid programs on new freshman persistence in particular. Progress toward more encompassing models of student persistence will necessarily be incremental as theory is only refined on the basis of empirical data. In light of the findings considered in this paper, it appears that the connection between student finances and persistence merits elaboration in future research.

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